

## Review

1. Answer questions about the weighted voting system below.

$P_1 P_2 P_3 P_4 P_5 \leftarrow P_6$   
 $[67 : 50, 30, 10, 5, 4, 1].$

(a) How many players are there? 6

(b) What is the quota? 67

(c) What is the total weight of the voting system?  $50+30+10+5+4+1 = 100$

2. Explain the terminology below. Then use the voting system from #1 to add illuminating examples.

(a) coalition - a group of players that vote together  
 say  $\{P_1, P_3, P_4\}$ .

(b) winning coalition - a coalition with weights that sum to at least the quota.

$\{P_1, P_2\}$  have total weight of  $50+30=80 > 67$  !

(c) critical player - a player in a winning coalition that, if they leave the coalition, it will no longer be winning.

Both  $P_1$  and  $P_2$  are critical.

(d) dictator - a player whose weight is the quota or larger.

No dictators in example 1.

(e) a player with veto power - a player who is critical in every winning coalition.

$P_1$  has veto power b/c the sum of weights of all other players  $P_2, P_3, P_4, P_5, P_6$  is not enough to reach the quota

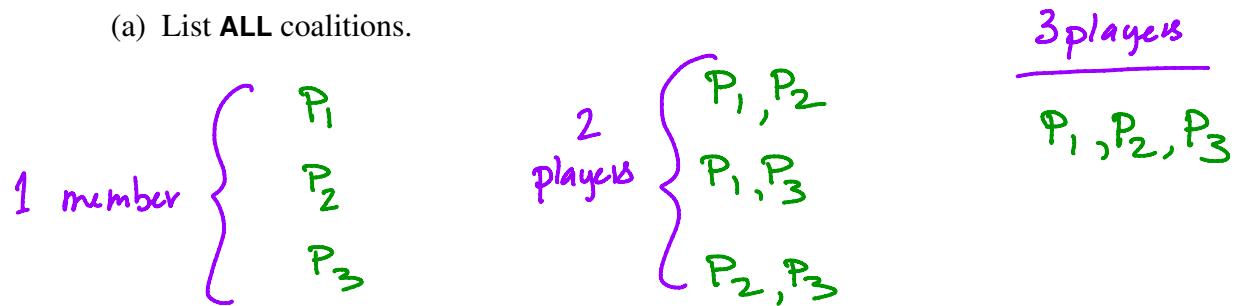
(f) a dummy player - a player who is never critical in any winning coalition

$P_6$  is a dummy b/c no collection of players can sum to  $67 - 1 = 66$

3. Answer questions about the weighted voting system below.

[30 : 25, 10, 5]

(a) List **ALL** coalitions.



(b) List all **WINNING** coalitions.

$$\underline{P_1}, \underline{P_2} : 25+10=35$$

$$\underline{P_1}, \underline{P_2}, \underline{P_3} : 25+10+5=40$$

$$\underline{P_1}, \underline{P_3} : 25+5=30$$

(c) In each **winning** coalition listed above, underline the critical players.

(d) Calculate the Banzhaf Power index.

i. Find all winning coalitions



ii. Find all critical players

iii. Underline critical players

iv. Count total # underlines

v. For each player, compute:

$$= 5 \rightarrow \frac{\text{\# times the player is underlined}}{\text{total \# underlines}}$$

player	# times underlined	$\frac{\text{\# times}}{\text{total}}$
P <sub>1</sub>	3	$\frac{3}{5} = 60\%$

P <sub>2</sub>	1	$\frac{1}{5} = 20\%$
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P <sub>3</sub>	1	$\frac{1}{5} = 20\%$
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